

**CONTOURED LAMINATED SLATE AND METHOD FOR PRODUCTION
THEREOF**

5 **BACKGROUND OF THE INVENTION**

 Field of the Invention

 This invention relates generally to the field of laminated slate products and, more particularly, to a process for creating a light weight contoured laminated slate element for use in architectural and artistic products.

10 Description of the Related Art

 Slate is a well know material for architectural and artistic uses. The myriad of colors and textures of slate available provide aesthetically pleasing appearance as tiles and in sheet product for inlays, wall panels and other accessories. Slate has become particularly popular as an element of fountains due to the laminar flow effects of
15 water over a slate surface and the enhancement of colors created by wetting the slate.

 Examples of fountains employing slate in vertical wall mounted units or self-standing fountains are produced by Water Wonders, Inc. of Santa Maria, California. Such fountains may be small table top units or complete walls of shimmering water effects.

20 The use of slate in such products is hampered by the weight of slate sheets required to achieve sufficient structural strength in the slate and the limitation to planar applications due to the rigidity of the slate.

 It is therefore desirable to provide a laminated slate product that is lighter weight than raw slate sheet while retaining the necessary structural strength to avoid
25 cracking of the slate.

Certification under 37 C.F.R. §1.10

This correspondence is being filed by Express mail addressed to
Commissioner for Patents, P.O. Box 1450
Alexandria, VA 22313-1450

Express Mail No.: ER 494858445 US

on Date: 02/27/2004

By: 
Felix L. Fischer, Registration No. 31,614

Additionally, it is desirable for a laminated slate product to be formable to allow production of contoured slate products for increased aesthetic appearance and practical application.

5 SUMMARY OF THE INVENTION

The present invention comprises a contoured laminated slate having a slate veneer backed by a cured resin. The contoured laminated slate is produced by cutting a sheet of slate to a desired dimension then placing a form around the edges of the slate sheet. Resilient dams are inserted intermediate the slate sheet and the form and a
10 resin layer is poured over the slate sheet to form a laminated slate precursor. The resin is allowed to partially cure and the resilient dams and form are removed. A slate veneer which is adhered to the resin is cleaved from the slate sheet and placed onto a contoured mold. The laminated slate precursor is pressed to the mold surface and the resin is allowed to completely cure. The contoured laminated slate is then removed
15 from the mold.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features and advantages of the present invention will be better understood by reference to the following detailed description when considered in
20 connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of a preparatory form for the slate laminating process of the present invention;

FIG. 2 is a perspective view of the form of FIG. 1 with removable foam inserts employed as resin dams in place around the slate sheet;

25 FIG. 3 is a partial section view of the form of FIG. 2 with the laminated slate precursor in place.

FIG. 4 is a perspective view of a first embodiment of a contour mold having a lateral wave pattern to receive the laminated slate precursor;

FIG. 5 is a perspective view of a second embodiment of a contour mold
30 having a longitudinal arc to receive the laminated slate precursor; and,

FIG. 6 is a drawing of the contoured laminated slate in its completed form.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings, FIG. 1 shows the basic rectangular form 10
5 to create the precursor slate laminate according to the present invention. For the
embodiments shown, the form is of wooden construction. A slate sheet 12 having the
desired dimensions is placed in the form, or conversely the form is placed over the cut
rectangular sheet of slate. The form has sufficient spacing from the slate on all four
edges to allow placement of resilient dams 14 between the form and slate as shown in
10 FIG. 2. For the embodiments shown, the resilient dams are sheets of 1 1/2 inch rigid
foam. For the embodiment shown, the dams are fabricated from laminated
polyethelyne foam. The slate laminate precursor is formed by pouring a liquid resin
mixture over the slate, covering the slate to the edges interfaced by the dams with a
thickness of approximately 1/4 inch. FIG. 3 shows the laminated slate precursor
15 comprising the slate sheet 12 and resin layer 16 in place in the form with the foam
dams. The cleaved veneer layer 18, as will be described in greater detail
subsequently, is shown in exaggerated scale for clarity.

For an exemplary embodiment of the invention, the liquid resin is a two part
polyether polyol/diisocyanate available from Hydroseal Polymers, Inc. of Riverside,
20 California as product HC 650. The resin is mixed in equal parts by weight with added
colorant to provide a compatible matching color for the slate. Black iron oxide
pigment available as product no. BK50990 from Elements Pigment has been
demonstrated to provide good results in color matching without degradation of the
resin. The resin is allowed to cure on the slate for approximately 15 minutes until the
25 resin begins to solidify but remains malleable. The foam dams are removed and the
rectangular form is lifted from the slate laminate precursor. A flat sharpened metal
tool is employed to cleave the slate creating a veneer of the slate adhered to the resin
as a precursor for the contoured laminated slate product. For the currently employed
embodiment of the method, the tool is employed beginning at one corner of the slate
30 sheet approximately 1/16 inch below the resin line. The 1/16 inch slate layer is

cleaved from the slate sheet by working the cleaving tool back and forth in jabbing strokes between the slate sheet and slate/resin veneer until the laminated slate precursor is free from the host slate sheet.

The laminated slate precursor is transferred promptly after cleaving to a contour mold for shaping. An exemplary wave mold 20 is shown in FIG. 4. This mold has multiple curves forming waves. The slate laminate precursor is placed with the resin layer against the mold surface. With various resins or resin consistency, a mold release agent is employed to avoid adherence of the resin to the mold surface. Pressure is applied to the slate laminate precursor to conform to the surface of the mold. Sandbags are placed over the surface of the slate laminate precursor to assure that contact is maintained between the mold and precursor during curing of the resin. Sand bags provide an evenly distributed weight applied to the entire precursor. Alternatively, a water bladder or vacuum bagging and processing is employed during curing. The resin on the slate laminate precursor is allowed to cure completely; approximately 2 hours for the resin employed in the embodiment as described. A stop 22 is provided to position a top edge of the laminate precursor on the mold and to prevent slippage during pressing and cure. Similarly, side stops 24a and 24b align the precursor with the mold and secure the precursor during pressing and cure.

An alternative shaping mold 26 is shown in FIG. 5 which provides a longitudinal bend in the rectangular slate laminate precursor. This mold has a single arc curve. Like the wave mold, the single curvature mold provides stops 28a and 28b to engage the side edges of the laminate precursor during pressing and cure. The stops include a cap 30 extending perpendicular to the side of the stop to prevent slippage of the precursor over the edge of the stop during initial bending of the precursor onto the mold. A cap block 32 is placed between the laminate precursor and the cap to urge the edges of the laminate precursor onto the mold surface.

The use of alternative molds allows the laminated slate to be shaped for various desired artistic or functional shapes. The molds shown in FIGs 4 and 5 provide contoured laminated slate for use in decorative fountains. Comparable molds in alternate scale can be employed to create single or double curvatures (S-curves) for

shaping of the slate laminate for use as roofing tiles or other functional architectural elements.

After curing, the completed contoured laminated slate product is lifted from the mold. Finishing processes including trimming or sanding of the resin/slate edges to achieve a desired appearance are applied to the product. FIG. 6 shows the completed contoured laminated slate for a single curve application.

With only a 1/16 inch thickness of slate veneer, the laminated slate is extremely light weight in comparison to a similarly sized piece of regular slate sheet. The resin provides structural support for the thin slate veneer reducing the potential for cracking. Fiber or glass reinforced resins for additional strength are employed in alternative embodiments. The laminated slate created using the inventive process is contoured providing a pleasing aesthetic effect unlike anything obtainable with regular sheet slate. Further, the contour provides additional rigidity in the laminated slate produced according to the process of the present invention as opposed to a flat laminated slate veneer.

Having now described the invention in detail as required by the patent statutes, those skilled in the art will recognize modifications and substitutions to the specific embodiments disclosed herein. Such modifications are within the scope and intent of the present invention as defined in the following claims.